

A direct probe of dark energy interactions with a solar system laboratory

Completed Technology Project (2017 - 2018)



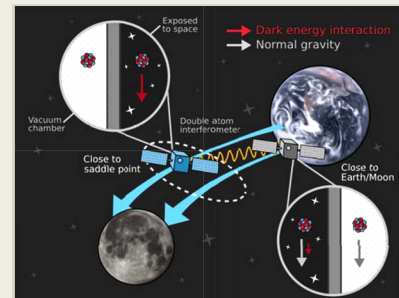
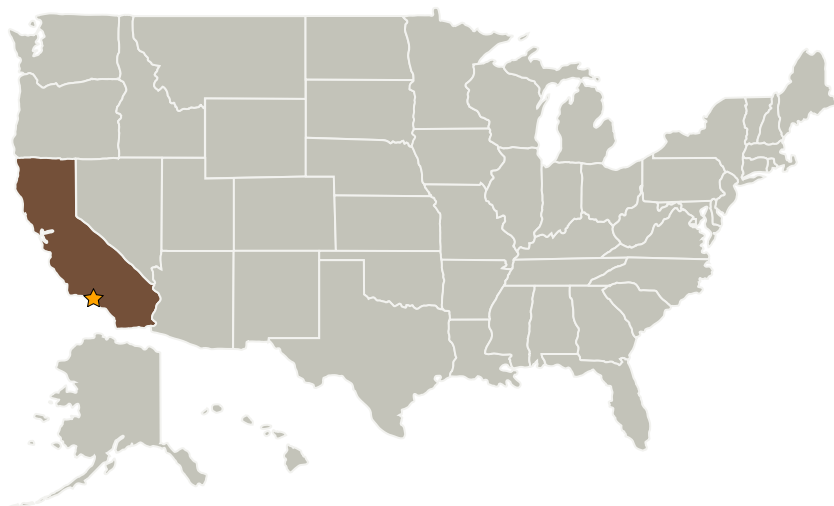
Project Introduction

We propose a mission concept for direct detection of dark energy interactions with normal matter in a Solar System laboratory. Dark energy is the leading proposal to answer the question of the accelerated expansion of the Universe. This interaction must be highly suppressed to be consistent with the gravity measurements and observations we have so far, but can be probed with specifically designed experiments. By flying unscreened atomic particles through special gravitational field regions in the Solar System and conducting double differential measurements to isolate possible dark energy interaction with the atoms, we will stand a chance to achieve a direction detection of dark energy, akin to direct detection of dark matter and gravitational waves. This could lead to a fundamental shift in our understanding of fundamental physics and our universe, stimulating a wide variety of foundational research in cosmology and particle physics.

Anticipated Benefits

This could lead to a fundamental shift in our understanding of fundamental physics and our universe, stimulating a wide variety of foundational research in cosmology and particle physics.

Primary U.S. Work Locations and Key Partners



Direct probe of dark energy interactions with a solar system laboratory. Credits: Nan Yu

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Organizations Performing Work	Role	Type	Location
★ Jet Propulsion Laboratory (JPL)	Lead Organization	NASA Center	Pasadena, California

Primary U.S. Work Locations
California

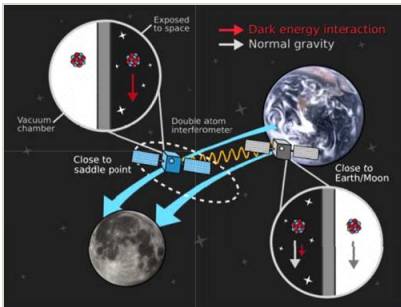
Project Transitions

▶ **April 2017:** Project Start

✓ **January 2018:** Closed out

Closeout Link: https://www.nasa.gov/directorates/spacetech/niac/2017_Phase_I_Phase_II/Dark_energy_interactions_solar_system_laboratory

Images



Project Image

Direct probe of dark energy interactions with a solar system laboratory. Credits: Nan Yu (<https://techport.nasa.gov/image/102133>)

Links

NASA.gov Feature Article (https://www.nasa.gov/directorates/spacetech/niac/2017_Phase_I_Phase_II/Dark_energy_interactions_solar_system_laboratory)

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Jet Propulsion Laboratory (JPL)

Responsible Program:

NASA Innovative Advanced Concepts

Project Management

Program Director:

Jason E Derleth

Program Manager:

Eric A Eberly

Principal Investigator:

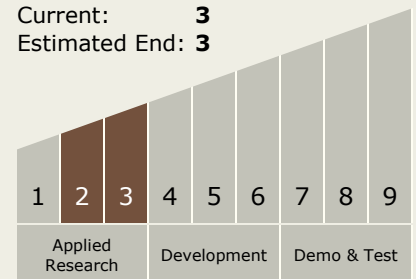
Nan Yu

Technology Maturity (TRL)

Start: **2**

Current: **3**

Estimated End: **3**



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Technology Areas

Primary:

- TX09 Entry, Descent, and Landing
 - └ TX09.4 Vehicle Systems
 - └ TX09.4.5 Modeling and Simulation for EDL

Target Destination

Foundational Knowledge